

L1 ANSWER 1 OF 1 CAPLUS COPYRIGHT 2005 ACS on STN

Full Text	Citing References
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AN 1999:21910 CAPLUS  
 DN 130:141541  
 ED Entered STN: 12 Jan 1999  
 TI Fuel oil composition  
 IN Fukumoto, Masahiro; Nishioka, Shinya; Sawamura, Takashi; Ishizaki, Koji;  
 Akaike, Yoshimitsu  
 PA Nippon Oil and Fats Co., Ltd., Japan  
 SO Jpn. Kokai Tokkyo Koho, 8 pp.  
 CODEN: JKXXAF  
 DT Patent  
 LA Japanese  
 IC ICM C10L001-18  
 ICS C10L001-08  
 CC 51-9 (Fossil Fuels, Derivatives, and Related Products)  
 FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
<u>JP 11001692</u>	<b>A2</b>	<b>19990106</b>	<u>JP 1997-157144</u>	<b>19970613</b>
<u>PRAI JP 1997-157144</u>		19970613		

## CLASS

PATENT NO.	CLASS	PATENT FAMILY CLASSIFICATION CODES
<u>JP 11001692</u>	ICM	C10L001-18
	ICS	C10L001-08

AB The compn. comprises (A) middle distillates (as a base oil) contg. S <0.2 wt.% and aroms. <40 wt.%, and (B) 0.0001-0.5 wt.%, preferably 0.002-0.1 wt.% of C8-30 fatty acid mixt. which contains 75 wt.% of unsatd. fatty acids having (1-15):(1-3) wt. ratio of a 1st fraction with single double bond (e.g., oleic acid) and a 2nd fraction with two double bonds in its structure (e.g., linoleic acid), and (C) other additives such as antioxidants, and low-temp. flow improvers. The compn. can be useful for diesel engines and shows good lubricity and antifriction properties.

ST diesel fuel compn emission control

IT Diesel fuel

(low-sulfur fuel oil compn.)

IT 101-96-2, N,N'-Di-sec-butyl-p-phenylenediamine 104-40-5 128-37-0,  
 2,6-Di-tert-butyl-p-cresol, uses

RL: MOA (Modifier or additive use); USES (Uses)

(antioxidant; fuel oil compn.)

IT 57-10-3, Palmitic acid, uses 57-11-4, Octadecanoic acid, uses 60-33-3,  
 Linoleic acid, uses 112-80-1, Oleic acid, uses

RL: MOA (Modifier or additive use); USES (Uses)

(antiwear additive contg.; fuel oil compn. for diesel engines)

IT 220035-04-1, ECA 8400 220035-34-7, Sunhib S 101

RL: MOA (Modifier or additive use); USES (Uses)

(low-temp. flow improver; fuel oil compn. for diesel engines)

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : **11-001692**

(43)Date of publication of application : **06.01.1999**

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(51)Int.Cl.

C10L 1/18

C10L 1/08

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(21)Application number : **09-157144**

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(22)Date of filing : **13.06.1997**

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### (54) FUEL OIL COMPOSITION

#### (57)Abstract:

PROBLEM TO BE SOLVED: To improve the lubricity of a low-sulfur middle distillate oil capable of meeting environmental regulations and obtain a fuel oil compsn. which reduces the abrasion of a fuel oil lubricating part of a diesel engine by incorporating a fatty acid mixture contg. specific unsatd. fatty acids into a middle distillate oil having specified sulfur content and arom. content.

SOLUTION: A fuel oil compsn. is prepd. by incorporating 0.001-0.5 wt.% (based on ingredient A described below) 8-30C fatty acid mixture (B) contg. at least 75 wt.% unsatd. fatty acid mixture comprising an unsatd. fatty acid (B1) having a double bond in the molecule and an unsatd. fatty acid (B2) having two double bonds in the molecule in a wt. ratio (B1:B2) of (1:3)-(15:1) into a middle distillate oil (A) having a sulfur content of 0.2 wt.% or lower and an arom. content of 40 wt. % or lower. When this compsn. contains a low-temp. flowability improver usually added to a fuel oil, the lubricity of this compsn. can be improved without hindering the effect of the improver.

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### LEGAL STATUS

[Date of request for examination]

29.01.2004

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

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CLAIMS

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[Claim(s)]

[Claim 1] The middle distillate which contains a part for 0.2 or less % of the weight and aromatic series for a sulfur content 40 or less % of the weight (A component), To intramolecular, one double bond having -- unsaturated fatty acid -- (-- a --) -- intramolecular -- two -- a \*\* -- a double bond -- having -- unsaturated fatty acid -- (-- b --) -- weight -- a ratio -- [ -- (-- a --) -- : -- (-- b --) -- ] -- 1:3 - 15:1 -- comparatively -- coming out -- containing -- unsaturated fatty acid -- 75 -- % of the weight -- more than -- containing -- a carbon number -- eight - 30 -- a fatty acid -- mixture (B component) -- said middle distillate -- receiving -- The fuel oil constituent contained 0.001 to 0.5% of the weight.

[Claim 2] The fuel oil constituent according to claim 1 whose unsaturated fatty acid which has one double bond in intramolecular is oleic acid and whose unsaturated fatty acid which has two double bonds in intramolecular is linolic acid.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the fuel oil constituent in which the lubricity which was excellent to the fuel oil lubrication part of a diesel power plant in detail is shown about the fuel oil constituent which improved the lubricity of low-sulfur fuel oil.

[0002]

[Description of the Prior Art] By the diesel power plant, since the system which injects high-pressure fuel oil with a fuel injection pump is used, the anti-wear agent which reduces wear of a jet pump from the former has been used. For example, the anti-wear agent containing the aliphatic series amide of fatty acid ester, the dimerization fatty acid of partial saturation, first-class fatty amine, or diethanolamine has been used as indicated by the U.S. Pat. No. 2252889 specification, the 4185594 specification, the 4208190 specification, and the 4204481 specification. Moreover, the anti-wear agent included in aliphatic series monocarboxylic acid to a diesel alternate-fuel oil has been used as indicated by the U.S. Pat. No. 4248182 specification.

[0003] However, the amount of [ the sulfur content contained in gas oil or ] aromatic series came to have big effect on the environment with increase of truck line in recent years. Regulation of already "restricting considerably the content for the sulfur content in the gas oil which participates in emission of the pollutant in the exhaust gas from a diesel power plant (SOx, NOx, dust, and smoke), and aromatic series" in an area like California and Sweden is adopted, and this inclination tends to spread in the whole world.

[0004] For example, the law which the law which restricts the permission sulfur content in gas oil to 0.05 or less % of the weight has passed, and also restricts a part for aromatic series to 10 or less % of the weight in 1993 and afterwards is added in U.S. California in 1985 and afterwards. The law restricted to 0.05 or less % of the weight of sulfur contents and 35 or less % of the weight of aromatic series part contents has passed one after another in the United States after the same year.

[0005] NOx discharged from an automobile also in Japan by the reply of Central Council for Environmental Pollution Control in December, 1989 -- being short-term (1993- 1994) -- to reduce 40 to 60% of the weight 20 to 35% of the weight for it to be long-term (less than ten years) is demanded. Reduction of sulfur contents is called for for installation of the new technique which reduces NOx. For this reason, it is decided to reduce the sulfur content in gas oil gradually to 0.05% of the weight for the purpose of 1997 further 0.2% of the weight in 1992.

[0006] Generally reduction for the sulfur content in gas oil and aromatic series is performed by the catalytic hydrogenation processing in petroleum refining. However, the reduction for the sulfur content in gas oil and aromatic series led to the lubricative fall of gas oil, and the problem that damage on components, such as a pump of the injection equipment of a diesel power plant and a nozzle, by it occurs has produced it.

[0007] About the gas oil which has 0.2 % of the weight or more of sulfur contents, and 40 % of the weight or more of aromatic series parts till today, the problem related to lubricity was solved by using an anti-wear agent said bottom. However, when the amount of 0.2 or less % of the weight and aromatic series were 40 or less % of the weight, even if the sulfur content in gas oil used the anti-wear agent, wear and printing arose in the injection pump (especially a rotary pump and an injector nozzle, a centrifugal-spark-advancer sleeve), the black smoke was produced and engine troubles, such as instability of idle rotation and an engine failure, occurred.

[0008] Although such a phenomenon is greatly influenced by the configuration and the quality of the material of the components which receive an engine design and a lubrication action, the improvement by the lubricative

grant agent for low sulfur diesel oil is tried. As a lubricative grant agent for low sulfur diesel oil, although the thing of an ester compound or an ether compound is indicated by the European Patent No. 605857 specification, JP,7-62363,A, and the Patent Publication Heisei No. 505893 [ eight to ] official report and JP,8-283753,A, as for these, still sufficient effectiveness is not acquired to low sulfur diesel oil with scarce lubricity.

[0009]

[Problem(s) to be Solved by the Invention] In order to improve this trouble, this invention raises the lubricity of the low-sulfur middle distillate corresponding to atmospheric control, and offers the fuel oil constituent which reduced wear of the fuel oil lubrication part of a diesel power plant.

[0010]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, as a result of inquiring wholeheartedly, by adding the fatty-acid mixture which contains the unsaturated fatty acid of a specific presentation in the middle distillate for the low sulfur corresponding to atmospheric control, and low aromatic series, this invention persons find out that lubricity can be improved and came to complete this invention. Namely, the middle distillate in which this invention contains a part for 0.2 or less % of the weight and aromatic series for a sulfur content 40 or less % of the weight (A component), To intramolecular, one double bond having -- unsaturated fatty acid -- (-- a --) -- intramolecular -- two -- a \*\* -- a double bond -- having -- unsaturated fatty acid -- (-- b --) -- weight -- a ratio -- [ -- (-- a --) -- : -- (-- b --) -- ] -- 1:3 - 15:1 -- comparatively -- coming out -- containing -- unsaturated fatty acid -- 75 -- % of the weight -- more than -- containing -- a carbon number -- eight - 30 -- a fatty acid -- mixture (B component) -- said middle distillate -- receiving -- It is the fuel oil constituent contained 0.001 to 0.5% of the weight.

[0011]

[Embodiment of the Invention] Since it corresponds to sulfur content regulation, the fuel oil used for this invention is a middle distillate for the low sulfur refined by hydrogenation of the degree of pole. A middle distillate is a middle distillate in distillation of petroleum, a gasoline, kerosene, gas oil, and a fuel oil are mentioned here, a boiling range is usually 130-400 degrees C, and it is gas oil (180-380 degrees C of boiling points) suitably. A sulfur content content preferably the middle distillate used for this invention 0.2 or less % of the weight 0.12 or less % of the weight, It decreases to 0.05 or less % of the weight preferably especially. An aromatic series part content further 40 or less % of the weight, desirable -- an aromatic series part content -- 35 or less % of the weight -- a part for and the polycyclic aromatic series of two or more rings -- the inside of a middle distillate -- 20 or less % of the weight -- especially -- desirable -- an aromatic series part content -- 30 or less % of the weight -- a part for and the polycyclic aromatic series of two or more rings -- the inside of a middle distillate -- 10 or less % of the weight of a middle distillate -- it is gas oil above all.

[0012] Such a specific middle distillate mixes straight run gas oil, direct desulfurization gas oil, indirect desulfurization gas oil, decomposition gas oil, a desulfurization light gas oil, desulfurization kerosene, etc., and usually uses what was adjusted to the sulfur content content and aromatic series part content which are specified to this invention.

[0013] The fatty-acid mixture of the carbon numbers 8-30 used by this invention contains unsaturated fatty acid 85% of the weight or more preferably 75% of the weight or more. as unsaturated fatty acid, the unsaturated fatty acid which has one double bond in intramolecular, and the unsaturated fatty acid which has two or more double bonds in intramolecular contain -- having -- desirable -- carbon numbers 12-24 -- the thing of carbon numbers 16-22 is mentioned more preferably.

[0014] Furthermore, the unsaturated fatty acid contained in the fatty-acid mixture used for this invention contains the unsaturated fatty acid (a) which has one double bond in intramolecular, and the unsaturated fatty acid (b) which has two double bonds in intramolecular as essential fatty acid. the mixing ratio of each unsaturated fatty acid -- it is the mixture which exists within fixed limits out of which 1:3-15:1 come out of comparatively by the weight ratio, 1:2-7:1 come out of comparatively preferably, and 2:3-2:1 come comparatively still more preferably, and which a rate [(a) : (b)] contains. Moreover, the total quantity of the unsaturated fatty acid (a) and unsaturated fatty acid (b) which are contained in unsaturated fatty acid is usually 85 % of the weight or more preferably 75% of the weight or more.

[0015] As unsaturated fatty acid (a) which has one double bond, a KAPURO lane acid, undecylenic acid, the myristoleic acid, palmitoleic acid, oleic acid, a petroselinic acid, an elaidic acid, a vaccenic acid, a gadoleic acid, a gon DOIN acid, an erucic acid, brassidic acid, a selacholeic acid, etc. are mentioned to intramolecular.

As unsaturated fatty acid (b) which has two double bonds, a sorbic acid, linolic acid, etc. are mentioned to intramolecular, and an eleostearic acid, a linolenic acid, an arachidonic acid, clupanodonic acid, a herring acid, etc. are mentioned as unsaturated fatty acid which has three or more double bonds. furthermore, unsaturated fatty acid which contains hydroxyl in a molecule in addition to what was illustrated above, such as a ricinoleic acid and a cam ROREN acid, is illustrated as unsaturated fatty acid of each above.

[0016] The case where the unsaturated fatty acid which has one double bond in intramolecular among these unsaturated fatty acid is oleic acid, and the unsaturated fatty acid which has two double bonds in intramolecular is linolic acid is desirable especially from the field of the supply nature of a raw material, or a price. As a fatty acid of others which are contained in fatty-acid mixture, straight chain saturated fatty acid and a branched chain fatty acid are mentioned. As straight chain saturated fatty acid, the Nin acid, a lignoceric acid, a cerotic acid, a montanoic acid, a melissic acid, etc. are mentioned to a caprylic acid, pelargonic acid, a capric acid, undecanoic acid, a lauric acid, a myristic acid, a palmitic acid, stearin acid, arachin acid, and \*\*. As a branched chain fatty acid, 2-ethylhexanoic acid, iso nonoic acid, an iso tridecane acid, an iso palmitic acid, isostearic acid, etc. are mentioned.

[0017] The fatty-acid mixture used for this invention can also mix and prepare an above-mentioned fatty acid to the purification fatty acid which could mix and prepare the above-mentioned fatty acid, or performed the fatty acid of the natural oil fat origin, those judgment, hydrogenation, etc. As a fatty acid of the natural oil fat origin, palm oil fatty acid, a palm oil fatty acid, a palm-kernel-oil fatty acid, a beef tallow fatty acid, a hardening beef tallow fatty acid, a rapeseed oil fatty acid, a corn oil fatty acid, an olive-oil fatty acid, a sesame oil fatty acid, a soybean-oil fatty acid, a sunflower oil fatty acid, a castor oil fatty acid, a linseed oil fatty acid, a fish oil fatty acid, a hardening fish oil fatty acid, talloil fatty acid, etc. are mentioned.

[0018] It is appropriate for the addition of the fatty-acid mixture used for the fuel oil constituent of this invention to consider as 0.004 - 0.02 % of the weight more preferably 0.002 to 0.1% of the weight 0.001 to 0.5% of the weight to the above-mentioned specific middle distillate. When an addition exceeds 0.5 % of the weight, the addition effectiveness reaches a saturation state and the lubricative grant effectiveness of balancing an addition is not acquired. Moreover, when an addition is less than 0.001 % of the weight, sufficient lubricative grant effectiveness is not acquired.

[0019] In this invention, even if it adds fatty-acid mixture independently, the lubricity of the middle distillate corresponding to atmospheric control can be raised. Although the cold-temperature fluidity improver is usually added about use in a chill term or a cold district region, the fuel oil constituent of this invention can raise lubricity, without blocking the effectiveness of a cold-temperature fluidity improver. Although the fatty-acid mixture and the cold-temperature fluidity improver of this invention can be included at a rate of arbitration, the weight ratio of fatty-acid mixture and a cold-temperature fluidity improver has the desirable rate of 1:10-5:1.

[0020] The thing of the the very thing known as such a cold-temperature fluidity improver, for example, the copolymer of ethylene and saturation carboxylic-acid vinyl ester, The copolymer of ethylene and a methyl methacrylate, ethylene and the copolymer of an alpha olefin, The graft denaturation object of ethylene and the copolymer of an alpha olefin, a chlorination ethylene-vinylacetate copolymer, Ethylene, vinyl acetate, neo nonoic acid, or a terpolymer with NAODEKAN acid vinyl ester, The ester compounded from the nitrogen-containing compound, the saturation, or the unsaturated fatty acid containing the alkyl ester polymer of unsaturated carboxylic acid, and a hydroxyl group and partial ester, or its salt, Ester and partial ester (for example, behenic acid diester of the three mol addition product of ethyleneoxides of triethanolamine etc.) which are compounded from the alkylene oxide addition product, the saturation, or the unsaturated fatty acid containing a hydroxyl group of a nitrogen-containing compound, Ester and partial ester which are compounded from polyhydric alcohol, saturation, or unsaturated fatty acid, The ester compounded from polyoxy alkylene glycol, saturation, or unsaturated fatty acid, Ester and partial ester which are compounded from the alkylene oxide addition product, the saturation, or the unsaturated fatty acid of polyhydric alcohol, The polymer which contains the imide / amidation object of a partial saturation multiple-valued carboxylic acid and a primary amine as a monomer unit, An amide compound and its alkylene oxide addition product (for example, three mol addition product of propylene oxide of the behenic acid diamide of ethylenediamine etc.), Phosphoric acid or phosphorous acid, and the ester of those alkylene oxide addition products (for example, behenic acid triester of the three mol addition product of ethyleneoxides of phosphorous acid etc.), An alkenyl amber acid derivative (For example, the amide / amide salt of the coconut alkylamine of a tetra-propenyl amber acid) And chlorinated

paraffin / naphthalene condensates (for example, Friedel Crafts reaction product of chlorinated paraffin (carbon numbers 20-28) and naphthalene etc.) are mentioned. These cold-temperature fluidity improvers are one-sort independent, or can be used combining two or more sorts.

[0021] Since the lubricative grant effectiveness according [ the case where the cold-temperature fluidity improver of surfactant systems, such as the ester and partial ester which are compounded from the nitrogen-containing compound and alkylene oxide addition product which contain a hydroxyl group among these additives, saturation, or unsaturated fatty acid, and ester compounded from polyhydric alcohol and an alkylene oxide addition product, saturation, or unsaturated fatty acid, partial ester, is used ] to concomitant use is large, it is more desirable.

[0022] It is desirable to use a rusr-proofer and an antioxidant for the fuel oil constituent of this invention from the point of engine performance, such as storage stability. Various rusr-proofers can be used as a rusr-proofer. For example, dicarboxylic acid, such as alkyl or an alkenyl succinic acid, and a partial esterification object with alcohol, Derivatives, such as an ethyleneoxide addition product and an amidation object; Carboxylic-acid; dimer acid with polar groups, such as hydroxycarboxylic acid and a mercapto carboxylic acid, The polyacid and its derivative of unsaturated fatty acid, such as a trimer acid; A fatty acid, The alkaline earth metal of carboxylic acids, such as a naphthenic acid, an abiestic acid, an alkenyl succinic acid, and a thiocarboxylic acid, Carboxylate, such as various metallic element salts, such as magnesium and aluminum, and an amine salt; A dinonyl naphthalene sulfonic acid, Alkali-metal salts, such as alkylbenzene sulfonic acid, an alkaline-earth-metal salt, salt [ of sulfonic acids, such as an amine salt, ]; -- partial ester [ of polyhydric alcohol, such as a sorbitol and a glycerol, and carboxylic acids, such as oleic acid, ]; -- high-class -- a fatty alcohol; morpholine -- Amines, such as a diethanolamine derivative and an ethyleneoxide addition product of a rosin amine; the oil solubility surfactant which has polar groups, such as a phosphoric acid and a way acid, as the Lord or a side-lobes nature machine is mentioned. A desirable thing has alkyl, or ash-free type the ester group and amino group which are called an alkenyl succinic-acid derivative among these rusr-proofers. These rusr-proofers are one-sort independent, or can be used combining two or more sorts.

[0023] Various antioxidants can be used as an antioxidant. For example, alkylphenols, such as p-nonyl phenol, 2, 4-dimethyl-6-tert butylphenol, 2, 6-JI tert butylphenol, 2, 6-JI tert butyl-p-cresol, tert burylhydroxyanisole, 4 and 4'-methylenebis (2, 3-JI tert butylphenol), 4 and 4'-butylidenebis (3-methyl-6-tert butylphenol), Phenolic antioxidant;N [ , such as N-butyl-para aminophenol and a hydroxyphenyl fatty acid, ] and N'-JI sec butyl-p-phenylene diamine, Amine system anti-oxidants, such as alpha-naphthylamine, N-phenyl-alpha-naphthylamine, N, and N'-JISARI dust DIN -1 and 2-propylenediamine; Derivatives, such as alkyl ester, an amine salt, etc. of a laurylthio propionic acid, Sulfur system antioxidants, such as derivatives, such as alkyl ester, an amine salt, etc. of a carboxy ethyl thio succinic acid, are mentioned. Alkyl ester and the amine salt of alkylphenol, 2, 4-dimethyl-6-tert butylphenol, N, and N'-JI sec butyl-p-phenylene diamine, a hydroxyphenyl fatty acid, and a laurylthio propionic acid are preferably mentioned among these anti-oxidants. These antioxidants are one-sort independent, or can be used combining two or more sorts.

[0024] Although the fuel oil constituent of this invention can be prepared by only adding the above-mentioned additive blended if needed [ the fatty-acid mixture and if needed ] used for this invention to the above-mentioned middle distillate, preparation becomes easy by adding this fatty-acid mixture etc. as a gestalt of a thick solution with an organic solvent with a middle distillate and compatibility. As such an organic solvent, petroleum fractions, such as naphtha, kerosene, and gas oil, aromatic hydrocarbon, paraffin hydrocarbon, etc. are mentioned. When diluting and using by the organic solvent, what contains an additive 20 to 80% of the weight is desirable, and what is included 35 to 75% of the weight is more desirable.

[0025] Although not restricted especially about the combination approach of fatty-acid mixture and each additive, when blending a cold-temperature fluidity improver, after dissolving beforehand fatty-acid mixture and a cold-temperature fluidity improver in a suitable solvent, respectively, it is desirable to add them to a middle distillate. It is desirable to mix with fatty-acid mixture beforehand about a rusr-proofer or an antioxidant, and to add this to a middle distillate. The fuel constituent of this invention may use together additives, such as the cloudy point depressant further usually added by fuel oil, a cetane number improver, a metal deactivator, a detergent dispersant, an inflammable improver, a black-smoke reduction agent, a defoaming agent, a hue stabilizer, a deicing agent, sludge content powder, and a marker.

[0026]

[Example] Below, an example explains this invention further at a detail.

[0027] It blended with the middle distillate shown in one to example 15 table 3 at a rate which shows the additive (a rusr-proofer, an antioxidant, cold-temperature fluidity improver) of the fatty-acid mixture shown in Table 4, and others which carry out the following in Tables 1 and 2, and the fuel oil constituent of this invention was prepared.

[0028] Rusr-proofer B-1:tetra-pro pyrenyl succinic-acid propylene glycol ester B-2: The oleic acid aminoethylethanolamine hydrochloric-acid-ized inhibitor C-1:2, 6-JI tert butyl-p-cresol C-2:4-nonyl phenol C-3:N, N'-JI sec butyl-p-phenylene diamine cold-temperature fluidity improver D-1:ECA8400 (product made from Exxon Chemistry)

D-2: SANHIBU S101 (Nippon Oil & Fats Co., Ltd. make)

[0029]

[Table 1]

実施例番号	1	2	3	4	5	6	7	8
中間留出油	E-1	E-1	E-2	E-2	E-2	E-2	E-2	E-2
脂肪酸混合物 添加量 (重量%)*	A-4 0.015	A-5 0.015	A-1 0.01	A-1 0.0075	A-1 0.01	A-2 0.01	A-3 0.01	A-4 0.01
防錆剤 添加量 (重量%)*	B-1 0.001	B-2 0.002	—	B-1 0.0005	B-1 0.0005	—	—	—
酸化防止剤 添加量 (重量%)*	C-2 0.005	—	C-3 0.0025	—	—	C-1 0.003	—	—
低温流動性向上剤 添加量 (重量%)*	D-2 0.01	D-1 0.01	—	—	—	—	—	—

註) \* : 中間流出油に対する重量%

[0030]

[Table 2]

実施例番号	9	10	11	12	13	14	15
中間留出油	E-2	E-2	E-2	E-2	E-2	E-2	E-3
脂肪酸混合物 添加量 (重量%)*	A-4 0.01	A-4 0.005	A-4 0.01	A-5 0.005	A-5 0.01	A-5 0.01	A-4 0.0025
防錆剤 添加量 (重量%)*	B-1 0.0005	B-1 0.0005	B-1 0.0005	B-2 0.001	B-2 0.001	—	B-1 0.0005
酸化防止剤 添加量 (重量%)*	C-2 0.002	C-2 0.002	C-2 0.0025	—	—	C-3 0.0015	C-2 0.002
低温流動性向上剤 添加量 (重量%)*	D-1 0.03	D-2 0.025	D-2 0.025	D-2 0.025	D-2 0.025	—	D-2 0.025

註) \* : 中間流出油に対する重量%

[0031]

[Table 3]



中間留出油	E - 1	E - 2	E - 3
硫黄分 (重量%)	0.006	0.032	0.13
芳香族分 (重量%)	7	15	28
I B P (°C)	165	218	183
E P (°C)	281	353	371
$\Delta T(90-10)$ (°C)	66	72	131

註)

I B P : 中間留出油の初留点  
 E P : 中間留出油の留出終点温度  
 $\Delta T(90-10)$  : 90 wt% 留出温度と 10 wt% 留出温度との差

[0032]

[Table 4]

	飽和脂肪酸(%)		不飽和脂肪酸(%)			不飽和脂肪酸 含量(%)	$C_{18}:F_1 / C_{18}:F_2$ (重量比)
	$C_{18}$	$C_{18}$	$C_{18}:F_1$	$C_{18}:F_2$	$C_{18}:F_3$		
A-1	4	1	85	8	2	95	11/1
A-2	23	-	64	10	3	77	6/1
A-3	12	5	36	40	8	83	1/1
A-4	4	1	43	43	9	95	1/1
A-5	1	1	31	46	20	98	2/3

註)

$C_{18}$  : 高純度パルミチン酸 (パルミチン酸 99.3 重量%)  
 $C_{18}$  : 高純度ステアリン酸 (ステアリン酸 99.1 重量%)  
 $C_{18}:F_1$  : 高純度オレイン酸 (日本油脂 (株) 製 EXTRA OLEIC 99、  
 オレイン酸 99.6 重量%)  
 $C_{18}:F_2$  : 高純度リノール酸 (日本油脂 (株) 製 EXTRA LINOLEIC 99、  
 リノール酸 99.3 重量%)  
 $C_{18}:F_3$  : 高純度リノレイン酸 (日本油脂 (株) 製 EXTRA  $\gamma$ -LINOLEIC 99、  
 $\gamma$ -リノレイン酸 99.1 重量%)  
 % : 脂肪酸混合物中の重量%

[0033] Lubricative evaluation was performed about the obtained fuel oil constituent using the lubrication wear test machine. 10mm, 3.0mm disk in phi thickness by the PCS INSU vine face company, and the phi6mm bearing ball were used as a specimen, using an oscillating friction abrasion tester (HFRR testing machine) as a lubrication wear test machine. Said additive of the specified quantity was added to said low sulfur diesel oil, and lubricity was measured on the conditions shown below.

[0034] Testing machine : P HFR2 (Ver.3.0) by CS INSU vine face company

specimen quality-of-the-material: -- a disk and a ball -- Steele AISI E-52100 temperature (degree-C): 60 soil 2  
 amplitude -- amount (ml) of (mm): 1.0\*\*0.03 samples: 2.0 \*\*0.20 operation-time (minute): -- 75 \*\*0.1 load (g) -  
 - surface area [ of a : 200\*\*1 vibration-frequency (Hz): 50\*\*1 sample bath ] (cm<sup>2</sup>): -- 6\*\*1 [0035] The diameter  
 of the oscillating direction of the abrasion of an up ball and the rectangular direction was measured by  
 microscope observation, and it asked for the pitch diameter of an abrasion. Furthermore, it classified into the  
 four following steps according to the configuration of an abrasion. Configuration of an abrasion Only the  
 shallow filament marks to the oscillating direction are seen. ----- \* Deep filament marks are seen in part. -----  
 ---- \*\* Pseudo-\*\*\*\*\* and abrasive wear are seen in part. ----- \*\*\* Condensation wear and abrasive wear are  
 seen in the whole region. ---- \*\*\*\* [0036] Moreover, comprehensive evaluation shown in Table 5 from the  
 pitch diameter of an abrasion and a configuration was also performed.

[0037]

[Table 5]

摩耗痕の平均径 (mm)	摩耗痕の形状	総合評価
0. 3 2 5 未満	*	◎
0. 3 2 5 未満	**	◎
0. 3 2 5 ~ 0. 4 0 0	*	○
0. 3 2 5 ~ 0. 4 0 0	**	○
0. 3 2 5 ~ 0. 4 0 0	***	△
0. 4 0 0 ~ 0. 4 5 0	**	△
0. 4 0 0 ~ 0. 4 5 0	***	×
0. 4 5 0 以上	***	×
0. 4 5 0 以上	****	×

[0038] furthermore, the examples 1 and 2 containing a cold-temperature fluidity improver and 9- the constituent of 13 and 15 -- being related -- as evaluation of low-temperature-performance ability -- JIS The blinding point (CFPP) was measured based on the convention of K-2288. A result is shown in Table 6.

[0039]

[Table 6]

	摩耗痕の平均径 (mm)	摩耗痕の形状	総合評価	CFPP (°C)
実施例 1	0. 3 6 3	**	○	- 2 3
実施例 2	0. 3 9 8	**	○	- 2 6
実施例 3	0. 3 4 2	**	○	
実施例 4	0. 3 7 0	**	○	
実施例 5	0. 3 2 6	**	○	
実施例 6	0. 3 4 8	**	○	
実施例 7	0. 3 2 1	*	◎	
実施例 8	0. 2 9 5	*	◎	
実施例 9	0. 3 0 1	*	◎	- 4
実施例 10	0. 2 9 7	**	◎	- 8
実施例 11	0. 2 5 3	*	◎	- 8
実施例 12	0. 3 3 3	**	○	- 8
実施例 13	0. 2 8 4	*	◎	- 4
実施例 14	0. 3 1 7	**	◎	
実施例 15	0. 3 6 5	*	◎	- 7

[0040] About each middle distillate shown in example of comparison 1 table 3, measurement, observation of the configuration of an abrasion, and comprehensive evaluation were performed for the pitch diameter of an abrasion like the example 1. CFPP was measured still like the example 1. A result is shown in Table 7.

[0041]

[Table 7]

中間留出油	摩耗痕の 平均径 (mm)	摩耗痕の形状	総合 評価	CFPP (°C)
E-1	0.688	****	×	-19
E-2	0.585	****	×	-1
E-3	0.481	****	×	+1

[0042] As shown in two to example of comparison 7 table 8, well-known lubricant was added to the middle distillate, and the fuel oil constituent was prepared. Measurement, observation of the configuration of an abrasion, and comprehensive evaluation were performed for the pitch diameter of an abrasion like the example 1 about the obtained constituent. A result is shown in Table 8.

[0043]

[Table 8]

	中間留出油	潤滑油	添加量 (重量%) <sup>*</sup>	摩耗痕の 平均径 (mm)	摩耗痕の 形状	総合 評価
比較例 2	E-1	ToA	0.015	0.513	****	×
比較例 3	E-2	ToA	0.01	0.419	***	×
比較例 4	E-2	ExO	0.01	0.370	***	△
比較例 5	E-2	ExL	0.01	0.388	***	△
比較例 6	E-2	G10	0.01	0.355	***	△
比較例 7	E-3	ToA	0.0025	0.435	***	×

註)

ToA..... トール油脂肪酸重合体 (モノマー酸: ダイマー酸: トリマー酸=8:74:18、重量比)  
 ExO..... 高純度オレイン酸 (日本油脂 (株) 製 EXTRA OLEIC99、オレイン酸99.6重量%)  
 ExL..... 高純度リノール酸 (日本油脂 (株) 製 EXTRA LINOLEIC99、リノール酸99.3重量%)  
 G10..... グリセリンオレイン酸ジエステル

[0044] The result of Tables 6-8 shows not spoiling low-temperature-performance ability of this cold-temperature fluidity improver, when lubricity is excellent and the cold-temperature fluidity improver is contained in the constituent, while a low-sulfur middle distillate is used for the fuel oil constituent of this invention. When it furthermore combines with the cold-temperature fluidity improver of a surfactant system, the lubricative grant effectiveness is known by that it is large.

[0045]

[Effect of the Invention] The fuel oil constituent of this invention raises the lubricity of the low-sulfur middle distillate corresponding to atmospheric control, and reduces wear of the fuel oil lubrication part of a diesel power plant. When the cold-temperature fluidity improver is furthermore contained in the constituent, low-temperature-performance ability of this cold-temperature fluidity improver is not spoiled.

[Translation done.]